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CMS Condition Monitoring System

Portable Vibration Analysis System

Kenjin

Compact, lightweight, portable vibration analysis system.

Kenjin

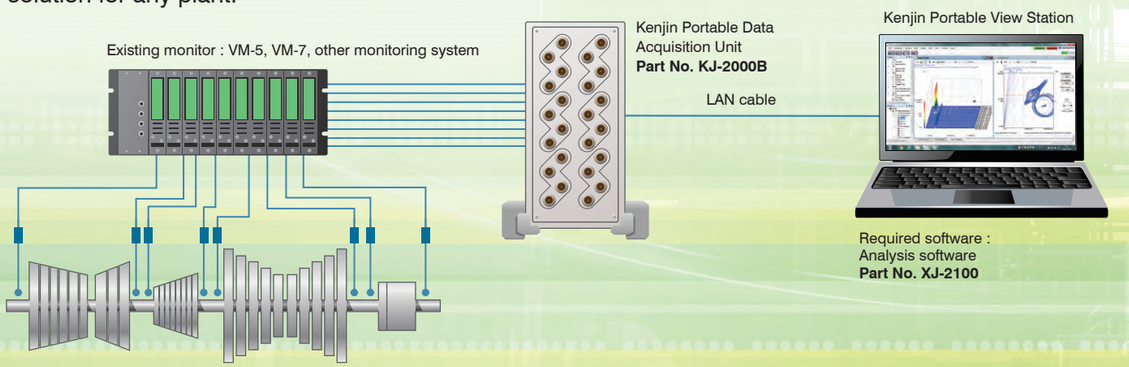
SHINKAWA

Easy to carry, easy to install.
Get real-time data acquisition with sophisticated off-line analysis system in a transportable package.

Kenjin is compact, lightweight, and transportable making it an excellent choice for vibration analysis on plant assets without permanent analysis system, and also for acquisition of transient data during startup/shutdown. This system can save time and money due to ease of use.

System Configuration

Simple configuration composed of a portable data acquisition unit and a laptop PC.
Ability to connect to existing vibration monitoring systems using buffered outputs make Kenjin a perfect solution for any plant.



Features

1 Compact, lightweight, transportable

Dimensions : 96 (W) x 224 (H) x 163 (D) mm Weight : 2.6 kg

2 Instant setup and on-site data analysis

This simple system is user friendly and efficiently provides the necessary information to analyze conditions of your critical assets.

3 High-speed data acquisition

Fast data acquisition intervals of trend data 0.1 sec and waveform data 0.1 sec.

* Time may vary, depending on the number of inputs and FFT lines (resolution).

4 Sophisticated data analysis and various graphs

The software provides a variety of analytical graphs which are optimized for the type of machinery and condition, satisfying stringent demands of vibration analysts and other plant personnel.

5 User-friendly operability and plotting functions

Intuitively software interaction with drag & drop graph display manipulation, graph area switching tab, etc.

Advantages

- **Simple setup**
- **Fast data acquisition**
- **On-site analysis of the machine condition during startup/shutdown.**
- **Abnormal machine conditions are easily identified to help prevent damage and catastrophic failures.**
- **Can be used for extended time period monitoring on BOP equipment.**

Applications

Steam turbines Gas turbines Electric generators Feed pumps Fans

Blowers Compressors BOP machinery Rotating equipment critical to your facility

Features 1 Compact, lightweight, transportable

Compact, easy to carry anywhere.

Dimensions : 96 (W) x 224 (H) x 163 (D) mm * Excluding the projection parts.

Weight : 2.6 kg * Weight does not include carrying case.

Features 2 Instant setup and on-site data analysis

Easy-to-carry portable vibration analysis system acquires and analyzes data of startup/shutdown and anomalies quickly and easily.

Features 3 High-speed data acquisition

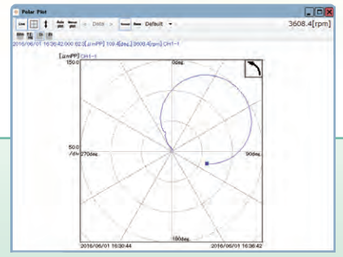
Fast high-resolution data acquisition provides detailed analytical graph display.
The user can see transient data even with a machine which completes startup period in a short period.

Features 4 Sophisticated data analysis and various graphs

Provides analysis/plotting functions required by vibration analysts certified in accordance with ISO 18436-2.

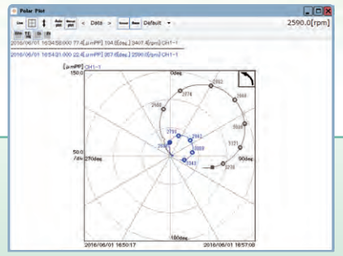
* ISO18436-2 : Condition monitoring and diagnostics of machines - Requirements for training and certification of personnel - Part 2 : Vibration condition monitoring and diagnostics

Data display examples



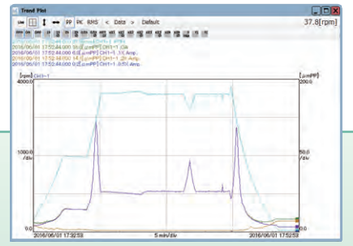
Polar Plot

This shows the vibration vector at the time of critical startup/shutdown of the machine. From this plot, the user can observe the balancing condition, vibration levels and critical speed during the startup/shutdown of the machine.
Displayed data (Switchable display): 1X, 2X
This allows over lay of current data on top of past data.



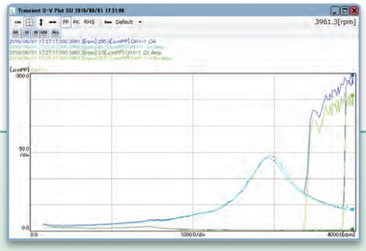
Polar Plot (reference superimposition and speed indication)

For easy comparison, the data set as the base line is plotted over the current or selected data. The rotation speed of multiple clicked points can be labeled on the field while the RPM (speed) button is active. At other times, the speed is displayed while the cursor is over the point.



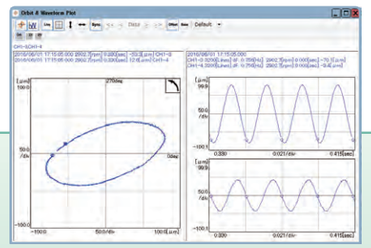
Trend Plot

This plot displays short term and long term chronological changes using a line chart.
Displayed data (multiple selections are allowed): Rotation speed, GAP, OA, 0.5 X amplitude, 0.5 X phase, 1X amplitude, 1X phase, 2X amplitude, 2X phase, Not-1X amplitude, nX1 to nX4 amplitude and phase, Smax amplitude, various alarm setting values.



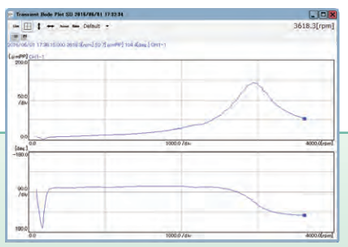
S-V Plot

A Speed - Vibration (S-V) trend plot shows the change in the vibration amplitude with rotation speed. The user can select multiple amplitude types from overall (OA), 0.5X, 1X, 2X, to display in the same field for understanding the critical speed or vibration condition during startup and shutdown of the rotating machinery.



Orbit and Waveform Plot

This plot composes signals from each X and Y sensor and displays the dynamic motion of the center of a rotating shaft. The Orbit plot helps to identify any abnormal status including imbalance, misalignment, oil whirl and oil whip.



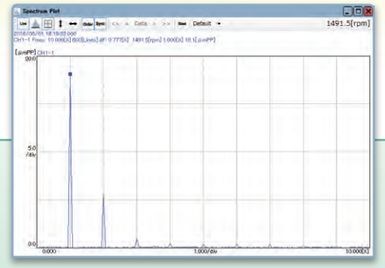
Bode Plot

This plot displays the amplitude and phase in separate graphs with rotation speed used as the horizontal axis.
From this plot, the user can see the vibration status and critical speed during the startup/shutdown of the machine.
Displayed data (Switchable display): 1X, 2X
This allows over lay of current data on top of past data.

Features 4

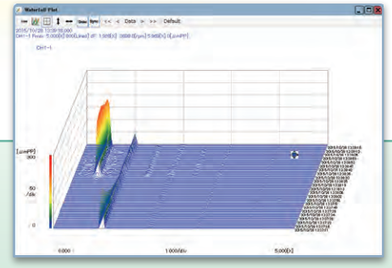
Sophisticated data analysis and various graphs

Data display examples



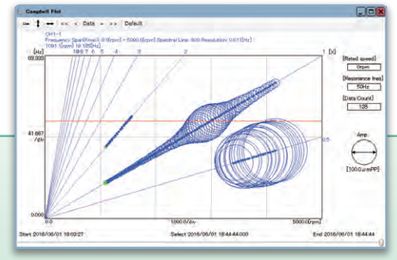
Spectrum Plot

This plot shows the frequency analysis of the vibration data. The X-axis represents the frequency or the order; the Y-axis shows the amplitude of each frequency component. The graph identifies the frequencies and the orders to help determine the cause of the abnormal condition of the rotating machinery.



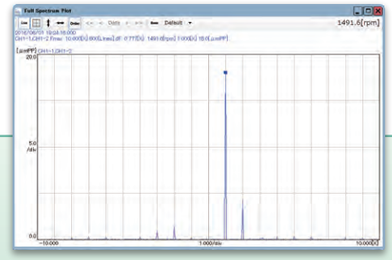
Waterfall Plot

This plot is used to analyze changes in frequency components that occur over time.
Cascade plot can also be displayed with width (z-axis) as rotation speed to analyze changes in frequency components in relation to changes in rotation speed.



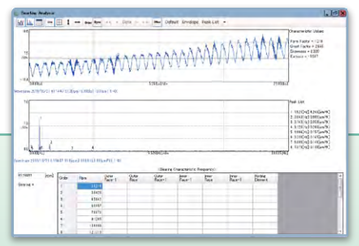
Campbell Plot (Optional)

The X-axis shows the rotation speed; the Y-axis expresses the vibration frequency; the radial lines indicate each order; the size of the circle represents the vibration amplitude. This shows the vibration level relative to the change in the rotation speed. Whether or not a sequence of vibration is accompanying a specific order or it is of a certain frequency component can be seen visually.



Full Spectrum Plot (Optional)

A spectrum plot that separately depicts the forward whirling motion and backward whirling motion of the rotating machine rotor. The X-axis is the frequency of the whirling motion (positive for forward, negative for backward), and the Y-axis is the amplitude of each frequency component or order.



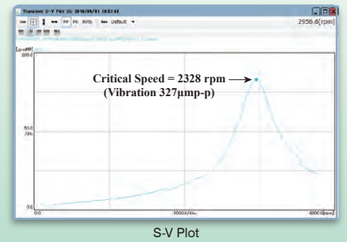
Bearing Analysis (Optional)

This window collectively displays the plots necessary for rolling bearing diagnosis. The following analysis functions are available per additional specification code, “/RB1” and “/RB2”.
/RB1 … Peak value analysis, order analysis, sideband analysis
/RB2 … Crest factor, form factor, kurtosis, skewness, envelope.

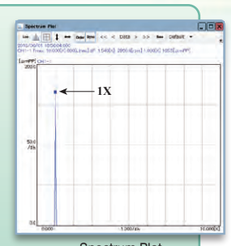
Case Studies

Unbalanced Vibration

The most common abnormal vibration is due to the mismatch between shaft center and mass center, due to manufacturing error or machine components missing.
The characteristic of the vibration generates the rotation synchronous component (1X), which is sine wave or similar. Vibration becomes largest at critical speed.



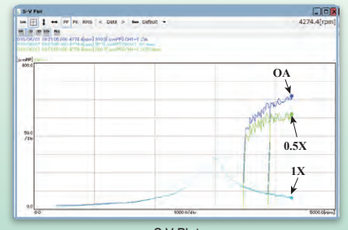
S-V Plot



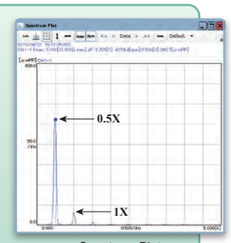
Spectrum Plot

Oil Whirl Vibration

Self-excited, unstable vibration typical for sleeve bearing supported rotating machinery. Possible causes include effects from the shape of the sleeve bearing, oil film characteristics, etc. Normally, this vibration appears at two or less times lower than the critical speed, and the frequency is around half the rotation synchronous frequency (0.5X).



S-V Plot

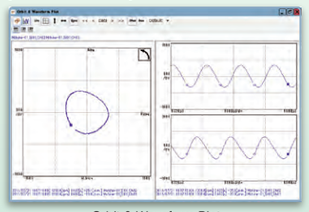


Spectrum Plot

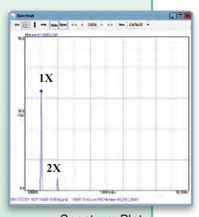
Misalignment Vibration

Vibration that occurs when the shaft centers of driving rotating machinery and its associated driven rotating machinery are not properly aligned. Typically the vibration includes rotation synchronous frequency component (1X) and harmonic components (2X, 3X).

[Normal condition]

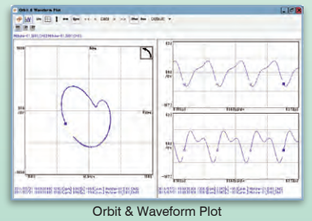


Orbit & Waveform Plot

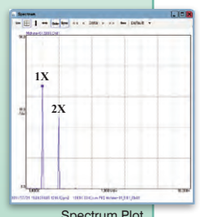


Spectrum Plot

[Misalignment occured]



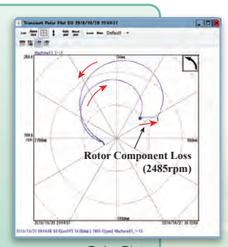
Orbit & Waveform Plot



Spectrum Plot

Loss of Rotor Component

When a rotor component is lost or flies off, the vibration conditions suddenly change. The typical phenomenon includes sudden changes in the amplitude and phase angle (vibration vector) of the rotation synchronous frequency component (1X).



Polar Plot

Features 5

User-friendly operability and plotting functions

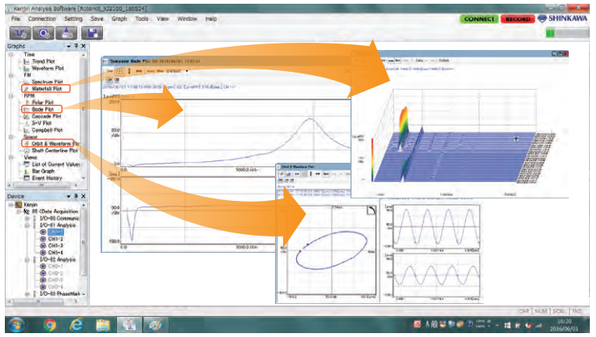
Kenjin (hardware & software) has a simple user interface, that is easy and instinctively operated by most plant personnel.

Quick learning of graphic display.

Examples of easy operation

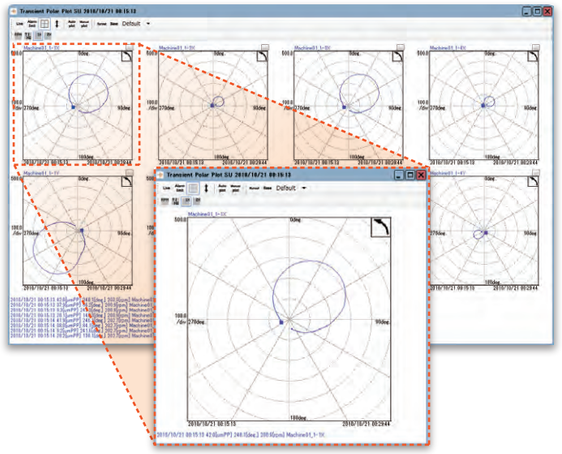
Drag & drop

From tree at left to display area at right, desired plots can be displayed anywhere you want.



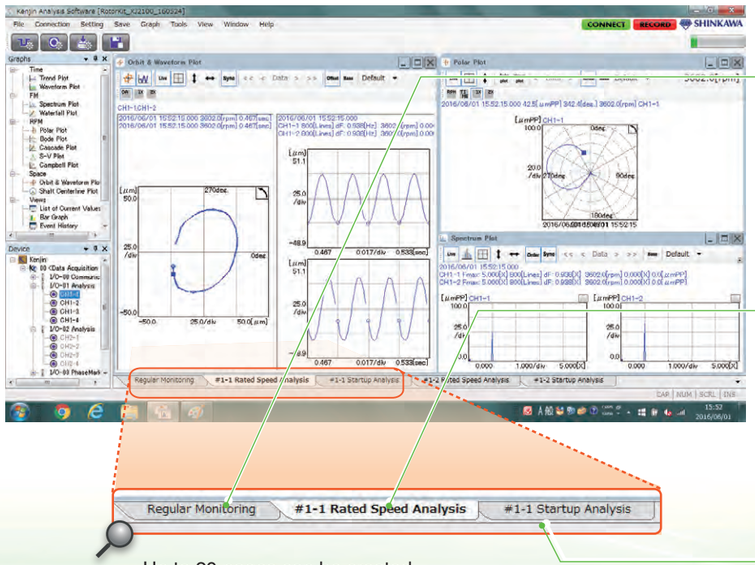
Tile display

Instant pickup of desired channel plot from tile display window. Channel plot specific window opens with one click.



Page switching tab

Desired graph display page can be displayed simply by switching the tabs.
A step to create a new page is also simple. (Up to 20 pages.)

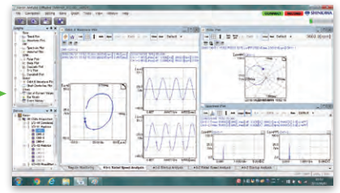


Up to 20 pages can be created.

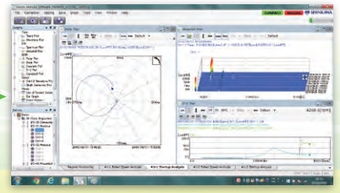
Pages with desired plots in desired arrangement can be created with specified tab name. Users can lock the displays as well, this allows uniformity and protection on your custom view settings.

Regular Monitoring Data sample page

Rated Analysis sample page



Startup Analysis sample page



Smooth configuration changes;

Smooth changing of configurations for input sensors, number of spectral lines and data acquisition intervals

Configuration changes without intermissions;

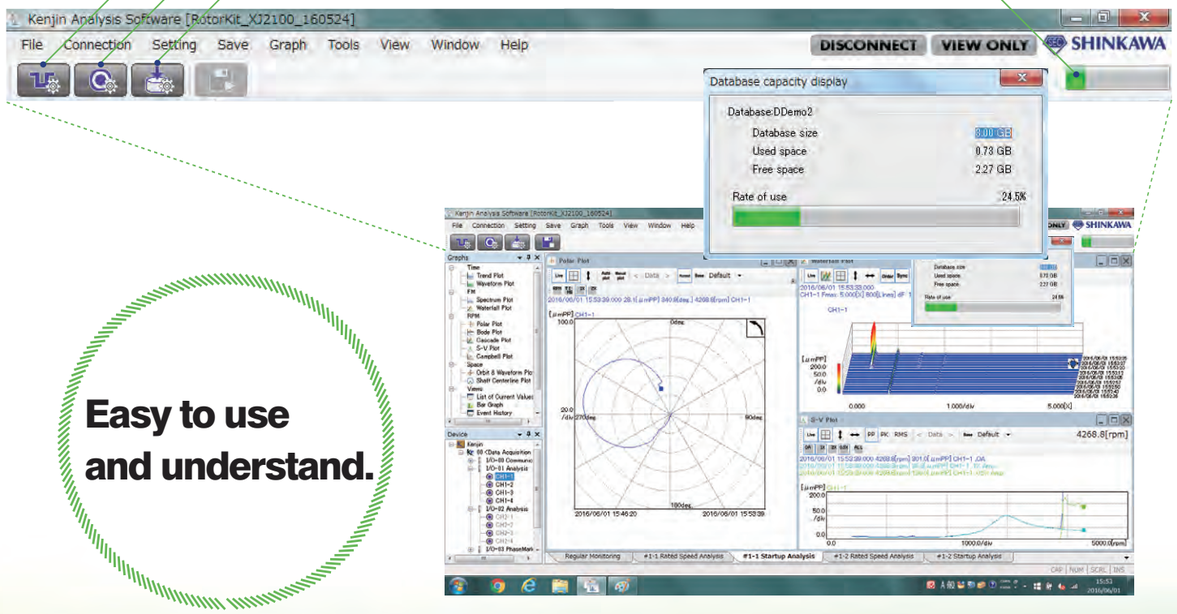
Setting values and data acquisition intervals can be changed even during data acquisition

Effective use of database capacity;

“VIEW ONLY” mode setting enables a user to watch real-time data without saving it.
Data storage is not required, making effective use of database capacity possible

Phase Marker setting
Basic setting
Data acquisition setting

Database usage display
Click here to show details.



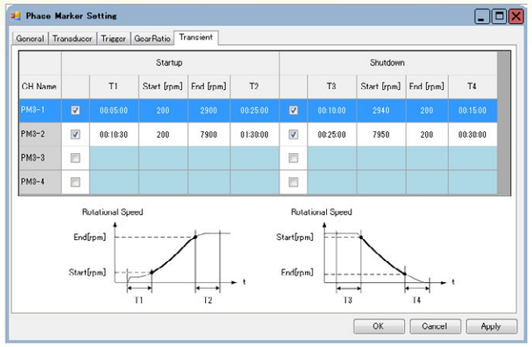
Easy to use and understand.

* If an older Kenjin system supplied before Sept. 2015 is to be upgraded, portable data acquisition device KJ-2000 needs to be modified to the matching version and also upgrading of Kenjin analysis software XJ-2000 to XJ-2100 is required.

Features 5

User-friendly operability and plotting functions

Kenjin configuration screen example



Phase marker setting screen example (transient setting)

Data extent is set by starting speed, ending speed, and pre-trigger time, and elapsed time for the increasing/decreasing speed during the machine start-up/shut-down. This can be later on easily retrieved, and displayed as a series of transient data from the transient list.

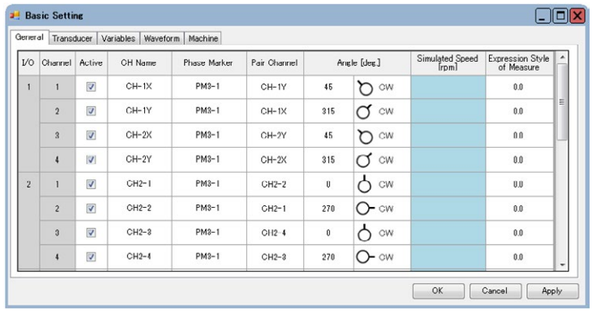
Transient data storage setting extent.

At start-up: T1 + starting rpm to ending rpm + T2
At shut-down: T3 + starting rpm to ending rpm +T4
T1 : 0 to 60 mins. T2: 0 to 180 mins.
T3: 0 to 60 mins. T4 : 0 to 60 mins.

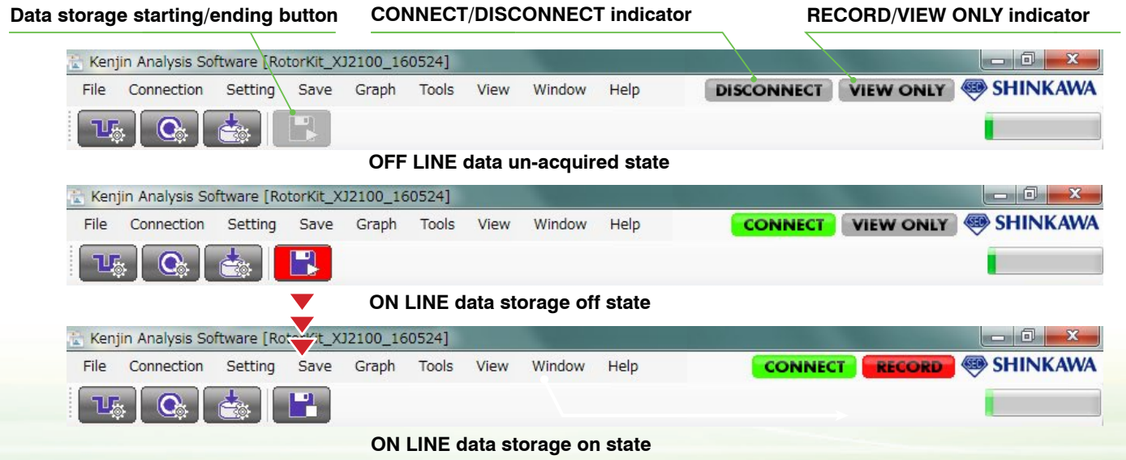
Base setting screen example (general)

Settings for;
phase marker allocations corresponding to each of the vibration channels, pair channel for X-Y installed vibration sensors, and installation angle of vibration sensors.

With the installation angle setting, when a numerical value is entered, corresponding installed angle image appears on the screen and visually seen, thus preventing setting errors by phase delay/progression etc. .

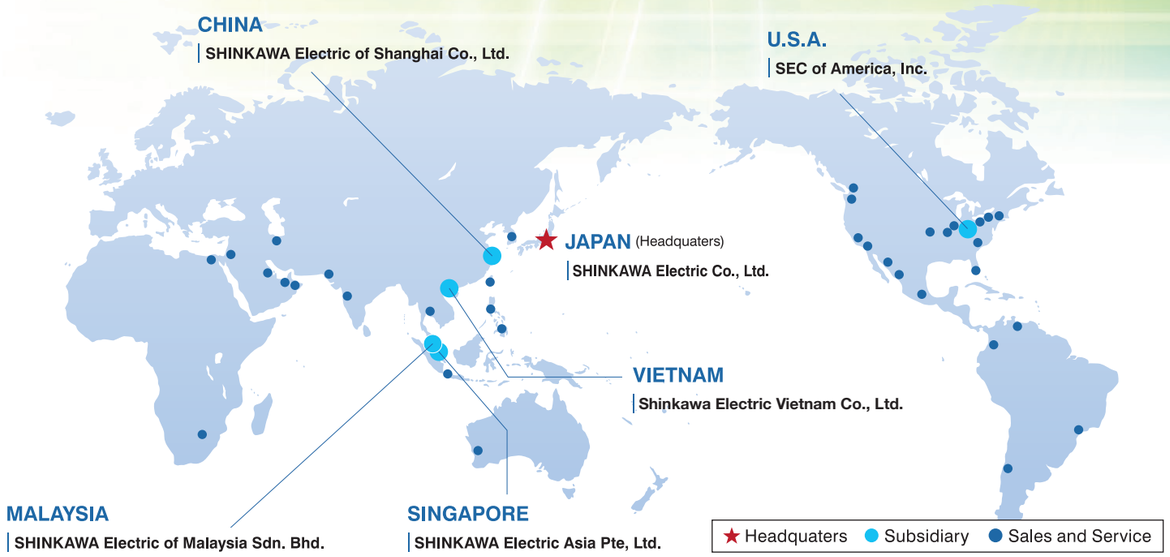


Data storage starting/ending button and indicator



The SHINKAWA Network

SHINKAWA is employing global thinking to create a business with a worldwide network currently comprising over 50 bases around the world.



Please refer to our website to find the information such as addresses and phone numbers of our subsidiaries.
URL: https://www.shinkawa.co.jp/eng/

Analysis Software Kenjin XJ-2100 Specifications

System requirements	
Processor	Intel® Core i5 or higher *1
Memory	4 GB or more recommended
Display	1366×768 or higher-resolution video adapter and monitor
Graphic card	DirectX® 9.0C supported *2
HDD	250 GB of available hard-disk space
Drive	DVD-ROM drive
Network	Ethernet 100 Base-TX
OS	Refer to the SHINKAWA website or date sheets.
Connection	
Connectable units	KJ-2000 Portable Data Acquisition Unit
Number of connectable units	1
Display	
Displayable graphs :	Trend Plot, Long Term Trend Plot, Bar Graph, Spectrum Plot, Waveform Plot, Orbit and Waveform Plot, Waterfall Plot, Polar Plot, Shaft Centerline Plot, X-Y Plot, S-V Plot, Bode Plot (Optional plots : Cascade Plot, Full Spectrum Plot, Full Waterfall Plot, Full Cascade Plot, Campbell Plot)
List view :	List of Current Values, Event History

*1 Intel is a registered trademark of Intel Corporation or its subsidiaries in the United States and other countries.
*2 DirectX is a registered trademark of Microsoft Corporation in the United States and other countries.
*3 Weight does not include the AC adapter and the carrying case.

Portable Data Acquisition Unit Kenjin KJ-2000B Specifications

Dimensions	96 (W) x 224 (H) x 163 (D) mm (Excluding the projection parts)
Weight	Maximum 2.6 kg *3
Environmental condition	
Operating temperature	-10°C to +45°C
Relative humidity	20 to 90% RH (non-condensing, non-submerged)
Power	85 to 264 VAC (using dedicated AC adapter)
Interface	
Communication	Ethernet 100 Base-TX
Connector	RJ-45
Input	
Number of vibration signal inputs	up to 20
Number of phase mark signal inputs	none, 4
Input voltage range	±20 V
Sensors supported	non-contact displacement / velocity / acceleration / phase mark
Connector	BNC connector
Sampling	
A / D resolution	24 bit
Sampling frequency	up to 51.2 kHz
Number of FFT lines	400 / 800 / 1600 / 3200
Communication	
Acquisition interval Trend data	0.1 sec (fastest) *4
Waveform data	0.1 sec (fastest) *4
Output	
Trend data	Rotation speed, GAP, OA amplitude, 0.5X amplitude / phase, 1X amplitude / phase, 2X amplitude / phase, nX amplitude*5 / phase, Not 1X amplitude, fX amplitude, Sp-p max amplitude
Waveform data	Synchronous sampling waveform, asynchronous sampling waveform

*4 Actual acquisition interval may differ depending on the number of channels and / or system requirements.
*5 "n" of "nX" can be set to any number between 0.01 and 10.00 in 0.01X step.